

Figure 2a
 Novel Compositions with Improved Chitinase Activity
 Muller, et al.
 Serial No. 10/692,367
 Atty Docket No. 2119-4280
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| | * | 20 | * | 40 | * | |
|------------|---|--------|---|----|---|----|
| ChitinaseA | : | ----- | CAGAACTGCGGCTGCCAGCCAACTTCTGCTGCAGCAAGTTCGG | : | | 44 |
| r1B6 | : | TCGATG | | | | 50 |
| r1B10 | : | TCGATG |GC.T.GGG.C.G.....CG..... | : | | 50 |
| r1D4 | : | TCGATG |G...G.A.....T.. | : | | 50 |
| r2A2 | : | TCGACG |GC.T.GGG.C.G.....CG..... | : | | 50 |
| r2C2 | : | TCGATG |G.A.....T.. | : | | 50 |
| r2E1 | : | TCGATG |GC.T.GGG.C.G.....CG..... | : | | 50 |
| r2H2 | : | TCGATG |G.A..... | : | | 50 |

| | | 60 | * | 80 | * | 100 | |
|------------|---|--|---|----|---|-----|-----|
| ChitinaseA | : | CTACTGCGGCACGACCGACGCCTACTGCGGCGACGGGTGCCAGTCGGGCC | : | | | | 94 |
| r1B6 | : |AG..... | : | | | | 100 |
| r1B10 | : | ..... | : |  |  |  | 100 |
| r1D4 | : |AG..... | : | | | | 100 |
| r2A2 | : | ..... | : |  |  |  | 100 |
| r2C2 | : |AG..... | : | | | | 100 |
| r2E1 | : | ..... | : |  |  |  | 100 |
| r2H2 | : |AG.....A.... | : | | | | 100 |

| | * | 120 | * | 140 | * | |
|------------|---|--|---|-----|---|-----|
| ChitinaseA | : | CGTGCCGCTCGGGCGGCGGGCGGCGGGCGGGCGGGCGGAGGCGGCGGA | : | | | 144 |
| r1B6 | : | ..... | : |  |  | 150 |
| r1B10 | : |A..A.T.....T..T.----- | : | | | 142 |
| r1D4 | : | ..... | : |  |  | 150 |
| r2A2 | : |A..A.T.....T..T.----- | : | | | 142 |
| r2C2 | : |T..... | : | | | 150 |
| r2E1 | : |A..A.T.....T..T.----- | : | | | 142 |
| r2H2 | : |T..... | : | | | 150 |

| | | 160 | * | 180 | * | 200 | |
|------------|---|--|---|-----|---|-----|-----|
| ChitinaseA | : | GGCAGTGGCGGTGCGAACGTGGCTAATGTGGTCACCGACGCGTTCTTCAA | : | | | | 194 |
| r1B6 | : |A..... | : | | | | 200 |
| r1B10 | : | -----GC..C.....G.T.C..... | : | | | | 179 |
| r1D4 | : |GC..C.....G.T.C..... | : | | | | 200 |
| r2A2 | : | -----GC..C.....G.T.C..... | : | | | | 179 |
| r2C2 | : | ..... | : |  |  |  | 200 |
| r2E1 | : | -----GC..C.....G.T.C..... | : | | | | 179 |
| r2H2 | : |G.....GC..C.....G.T.C..... | : | | | | 200 |

Figure 2b
 Novel Compositions with Improved Chitinase Activity
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| | | | | | | |
|------------|---|--|---|-----|---|--|
| | * | 220 | * | 240 | * | |
| ChitinaseA | : | CGGCATCAAGAACCAGGCCGGGAGCGGGTGCGAGGGCAAGAACTTCTACA | : | 244 | | |
| r1B6 | : |G..... | : | 250 | | |
| r1B10 | : |G..... | : | 229 | | |
| r1D4 | : |G..... | : | 250 | | |
| r2A2 | : |G.....T..... | : | 229 | | |
| r2C2 | : | ..... | : | 250 | | |
| r2E1 | : |G..... | : | 229 | | |
| r2H2 | : |G..... | : | 250 | | |

| | | | | | | |
|------------|-----|--|-----|-----|-----|--|
| | 260 | * | 280 | * | 300 | |
| ChitinaseA | : | CCCGGAGCGCGTTCTGAGCGCCGTCAACGCGTACCCGGGCTTCGCCCCAT | : | 294 | | |
| r1B6 | : |G.....A..... | : | 300 | | |
| r1B10 | : |G.....A..... | : | 279 | | |
| r1D4 | : | ..... | : | 300 | | |
| r2A2 | : |G.....A..... | : | 279 | | |
| r2C2 | : |CGAG...A..GC.....G... | : | 300 | | |
| r2E1 | : |G.....A..... | : | 279 | | |
| r2H2 | : |G.....A..... | : | 300 | | |

| | | | | | | |
|------------|---|--|---|-----|---|--|
| | * | 320 | * | 340 | * | |
| ChitinaseA | : | GGCGGGACGGAGGTGGAGGGCAAGCGCGAGATCGCCGCCTTCTTCGCGCA | : | 344 | | |
| r1B6 | : |T..C.....C..... | : | 350 | | |
| r1B10 | : |T..... | : | 329 | | |
| r1D4 | : | ..... | : | 350 | | |
| r2A2 | : |T..... | : | 329 | | |
| r2C2 | : |CT.C.....C...C.....T..... | : | 350 | | |
| r2E1 | : |T..... | : | 329 | | |
| r2H2 | : |T..... | : | 350 | | |

| | | | | | | |
|------------|-----|--|-----|-----|-----|--|
| | 360 | * | 380 | * | 400 | |
| ChitinaseA | : | CGTCACGCACGAGACCGGACATTTCTGCTACATCAGCGAGATCAACAAG- | : | 393 | | |
| r1B6 | : | ..C.....G.....A.....G..GG.C | : | 400 | | |
| r1B10 | : |G.....A.....G..GG.C | : | 379 | | |
| r1D4 | : | ..C.....G..... | : | 399 | | |
| r2A2 | : |G.....A.....G..GG.C | : | 379 | | |
| r2C2 | : | ..C.....G.....G..... | : | 399 | | |
| r2E1 | : |G.....A.....G..GG.C | : | 379 | | |
| r2H2 | : |G.....A.....G..GG.C | : | 400 | | |

Figure 2c
Novel Compositions with Improved Chitinase Activity
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| | * | 420 | * | 440 | * | |
|------------|---|--|---|-----|---|--|
| ChitinaseA | : | --AGCAACGCCTACTGCGACGCGAGCAACAGGCAGTGGCCGTGCGCGGCG | : | 441 | | |
| r1B6 | : | CG.....GAA.....CG..A.....C.....CA.... | : | 450 | | |
| r1B10 | : | CG.....GAA.....CG..A.....C.....CA.... | : | 429 | | |
| r1D4 | : | --..... | : | 447 | | |
| r2A2 | : | CG.....GAA.....CG..A.....C.....CA.... | : | 429 | | |
| r2C2 | : | --.....C...C...G.....C... | : | 447 | | |
| r2E1 | : | CG.....GAA.....CG..A.....C.....CA.... | : | 429 | | |
| r2H2 | : | CG.....GAA.....CG..A.....C.....CA.... | : | 450 | | |

| | 460 | * | 480 | * | 500 | |
|------------|-----|---|-----|-----|-----|--|
| ChitinaseA | : | GGGCAGAAGTACTACGGGCGCGGCCCGCTGCAGATCTCGTGGAACCTACAA | : | 491 | | |
| r1B6 | : | ...A..GG.....C.....C.....T... | : | 500 | | |
| r1B10 | : | ...A..GG.....C..... | : | 479 | | |
| r1D4 | : | | : | 497 | | |
| r2A2 | : | ...A..GG.....C..... | : | 479 | | |
| r2C2 | : | | : | 497 | | |
| r2E1 | : | ...A..GG.....C..... | : | 479 | | |
| r2H2 | : | ...A..GG.....C..... | : | 500 | | |

| | * | 520 | * | 540 | * | |
|------------|---|---|---|-----|---|--|
| ChitinaseA | : | CTACGGGCCCCGCCGGGAGGGACATCGGCTTCAACGGGCTCGCCGACCCCA | : | 541 | | |
| r1B6 | : |G.....C.....G.....GG.....G | : | 550 | | |
| r1B10 | : |G.....C.....G.....GG.....G | : | 529 | | |
| r1D4 | : |G..G.....AG.C.....G.....G.G.....G | : | 547 | | |
| r2A2 | : |G.....C.....G.....GG.....G | : | 529 | | |
| r2C2 | : |G.....C.....G.....GG.....G | : | 547 | | |
| r2E1 | : |G.....C.....G.....GG.....G | : | 529 | | |
| r2H2 | : |G.....C.....G.....GG.....G | : | 550 | | |

| | 560 | * | 580 | * | 600 | |
|------------|-----|--|-----|-----|-----|--|
| ChitinaseA | : | ACAGGGTGGCGCAGGACGCCGTGATCGCGTTCAAGACGGCGCTCTGGTTC | : | 591 | | |
| r1B6 | : | G.....G.....G.G.....G..... | : | 600 | | |
| r1B10 | : | G.....G.....G.G.....G..... | : | 579 | | |
| r1D4 | : | ..GC.....GCAG.....C.....CGCT.C.....A. | : | 597 | | |
| r2A2 | : | G.....G.....G.G.....G..... | : | 579 | | |
| r2C2 | : | G.....G.....G.G.....G..... | : | 597 | | |
| r2E1 | : | G.....G.....G.G.....G..... | : | 579 | | |
| r2H2 | : | G.....G.....G.A.....G..... | : | 600 | | |

Figure 2d
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| | * | 620 | * | 640 | * | |
|------------|---|--|---|-----|---|--|
| ChitinaseA | : | TGGATGAACAACGTGCACCGTGTGATGCCGCAGGGCTTCGGCGCCACCAT | : | 641 | | |
| r1B6 | : |G.....G.G..... | : | 650 | | |
| r1B10 | : |G...A.....AGC.C.....C.....G..... | : | 629 | | |
| r1D4 | : |G.G...G.....G.....C | : | 647 | | |
| r2A2 | : |G...A.....AGC.C.....C.....G..... | : | 629 | | |
| r2C2 | : | ..... | : | 647 | | |
| r2E1 | : |G...A.C.....AGC.C.....C.....G..... | : | 629 | | |
| r2H2 | : |G...A.....AGC.C.....C.....G..... | : | 650 | | |

| | 660 | * | 680 | * | 700 | |
|------------|-----|--|-----|-----|-----|--|
| ChitinaseA | : | CAGGGCCATCAACGGCGCCCTCGAGTGCAACGGGAACAACCCCGCCCAGA | : | 691 | | |
| r1B6 | : | | : | 700 | | |
| r1B10 | : | | : | 679 | | |
| r1D4 | : | | : | 697 | | |
| r2A2 | : | | : | 679 | | |
| r2C2 | : | | : | 697 | | |
| r2E1 | : | | : | 679 | | |
| r2H2 | : | | : | 700 | | |

| | * | 720 | * | 740 | * | |
|------------|---|---|---|-----|---|--|
| ChitinaseA | : | TGAACGCGCGCTCGGCTACTACAAGCAGTACTGCCAGCAGCTCCGCGTC | : | 741 | | |
| r1B6 | : | ..... | : | 750 | | |
| r1B10 | : |G.....GC.....G..... | : | 729 | | |
| r1D4 | : |G.....GC.....G..... | : | 747 | | |
| r2A2 | : |G.....GC.....G..... | : | 729 | | |
| r2C2 | : |G.....GC.....G..... | : | 747 | | |
| r2E1 | : |G.....GC.....G..... | : | 729 | | |
| r2H2 | : |G.....GC.....G..... | : | 750 | | |

| | 760 | * | |
|------------|-----|--------------------------|-------|
| ChitinaseA | : | GACCCAGGGCCCAACCTCACTTGC | : 765 |
| r1B6 | : | | : 774 |
| r1B10 | : |G..CAA.....C... | : 753 |
| r1D4 | : |C.....C... | : 771 |
| r2A2 | : |G..CAA.....C... | : 753 |
| r2C2 | : |G..CAA.....C... | : 771 |
| r2E1 | : |G..CAA.....C... | : 753 |
| r2H2 | : |G..CAA.....C... | : 774 |

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|------------|---|---|---|----|---|--|
| ChitinaseA | : | --QNCGCQPNFCCSKFGYCGTTDAYCGDGCQSGPCRSGGGGGGGGGGGGGG | : | 48 | | |
| r1B6 | : | SM.....E..... | : | 50 | | |
| r1B10 | : | SM....ASGL...R.....SS....--- | : | 47 | | |
| r1D4 | : | SM.....V.....E..... | : | 50 | | |
| r2A2 | : | ST....ASGL...R.....SS....--- | : | 47 | | |
| r2C2 | : | SM.....V.....E..... | : | 50 | | |
| r2E1 | : | SM....ASGL...R.....SS....--- | : | 47 | | |
| r2H2 | : | SM.....V.....E..... | : | 50 | | |

| | 60 | * | 80 | * | 100 | |
|------------|----------------------|-------------|-------------|------------|-------|-------|
| ChitinaseA | : GSGGANVANVVTD | AFFNGIKNQAG | SGCEGKNFYTR | SAFLSAVNAY | PGFAH | : 98 |
| r1B6 | : | S..... | ..... | K..... | | : 100 |
| r1B10 | : ----...S...GS..... | S..... | ..... | K..... | | : 92 |
| r1D4 | :S...GS..... | S..... | ..... |  |  | : 100 |
| r2A2 | : ----...S...GS..... | S..... | ..... | K..... | | : 92 |
| r2C2 | : ..... | ..... | ..... | E.IA..... | | : 100 |
| r2E1 | : ----...S...GS..... | S..... | ..... | K..... | | : 92 |
| r2H2 | :S...GS..... | S..... | ..... | K..... | | : 100 |

| | | | | | | | |
|------------|---|--|-----|-----|-----|---|--|
| | | * | 120 | * | 140 | * | |
| ChitinaseA | : | GGTEVEGKREIAAFFAHVTHETGHFCYISEINK-SNAYCDASNRQWPCAA | : | 147 | | | |
| r1B6 | : | ..SQ.Q.....A.....N..DGP.KN...RN.T....Q. | : | 150 | | | |
| r1B10 | : | ..S.....N..DGP.KN...RN.T....Q. | : | 142 | | | |
| r1D4 | : |A.....--..... | : | 148 | | | |
| r2A2 | : | ..S.....N..DGP.KN...RN.T....Q. | : | 142 | | | |
| r2C2 | : | ..S...R.....A.....V.--.....PTK..... | : | 148 | | | |
| r2E1 | : | ..S.....N..DGP.KN...RN.T....Q. | : | 142 | | | |
| r2H2 | : | ..S.....N..DGP.KN...RN.T....Q. | : | 150 | | | |

| | 160 | * | 180 | * | 200 | |
|------------|---|---|-----|---|-----|--|
| ChitinaseA | : GQKYYGRGPLQISWNYNYGPAGRDIGFNGGLADPNRVAQDAVIAFKTALWF | : | 197 | | | |
| r1B6 | : .KG.....F.....A...D..G..G...R...V...A.... | : | 200 | | | |
| r1B10 | : .KG.....A...D..G..G...R...V...A.... | : | 192 | | | |
| r1D4 | :SL..D..G..DA..RS..L..RS...Y | : | 198 | | | |
| r2A2 | : .KG.....A...D..G..G...R...V...A.... | : | 192 | | | |
| r2C2 | :A...D..G..G...R...V...A.... | : | 198 | | | |
| r2E1 | : .KG.....A...D..G..G...R...V...A.... | : | 192 | | | |
| r2H2 | : .KG.....A...D..G..G...R...V...A.... | : | 200 | | | |

Figure 3b
 Novel Compositions with Improved Chitinase Activity
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| | * | 220 | * | 240 | * | |
|------------|---|-------------------------------------|---|------------------|---|-----|
| ChitinaseA | : | WMNNVHRVMPQGFGATIRAINGALECNNGNNPAQM | : | NARVGYYKQYCQQLRV | : | 247 |
| r1B6 | : | ...S..G..... | : | | : | 250 |
| r1B10 | : | ..K.M.QL..... | : | R...R..G. | : | 242 |
| r1D4 | : |G.V.....T..... | : | R...R..G. | : | 248 |
| r2A2 | : | ..K.M.QL..... | : | R...R..G. | : | 242 |
| r2C2 | : | ..... | : | R...R..G. | : | 248 |
| r2E1 | : | ..K.I.QL..... | : | R...R..G. | : | 242 |
| r2H2 | : | ..K.M.QL..... | : | R...R..G. | : | 250 |

| | | | | |
|------------|---|----------|---|-----|
| ChitinaseA | : | DPGPNLTC | : | 255 |
| r1B6 | : | ..... | : | 258 |
| r1B10 | : | ...N.... | : | 250 |
| r1D4 | : | ..... | : | 256 |
| r2A2 | : | ...N.... | : | 250 |
| r2C2 | : | ...N.... | : | 256 |
| r2E1 | : | ...N.... | : | 250 |
| r2H2 | : | ...N.... | : | 258 |

Figure 6a
Novel Compositions with Improved Chitinase Activity
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| | | | | | | |
|------------|---|--|---|-----|---|-----|
| | * | 20 | * | 40 | * | |
| 4M1/1_H2 | : | TCGATGCAGAACTGCGGCTGCCAGCCAAACGTATGCTGCAGCAAGTTTGGCTACT | : | 55 | | |
| 4M1/11_C10 | : |G...GC.T.GGG.C.G.....CG...C..G.... | : | 55 | | |
| 4M1/26_C2 | : |G...GC.T.GGG.C.G.....CG...C..G.... | : | 55 | | |
| | | | | | | |
| | | 60 | * | 80 | * | 100 |
| 4M1/1_H2 | : | GCGGCACGACCGACGAGTACTGCGGCGACGGGTGCCAGTCGGGCCCCGTGCCGCTC | : | 110 | | |
| 4M1/11_C10 | : | ..... | : | 110 | | |
| 4M1/26_C2 | : |G...GG...G..C.....C..... | : | 110 | | |
| | | | | | | |
| | | 120 | * | 140 | * | 160 |
| 4M1/1_H2 | : | GGGCGGCGGCGGCGAGCAGTGGCGGCGGCGGAGGCGGCGGAGGCAGTGGCGGTGCG | : | 165 | | |
| 4M1/11_C10 | : |-----A..A.T.....T----- | : | 144 | | |
| 4M1/26_C2 | : |----- | : | 156 | | |
| | | | | | | |
| | * | 180 | * | 200 | * | 220 |
| 4M1/1_H2 | : | AACGTGGCTAATGTGGTCACCGACGCGTTCTTCAACGGCATCAAGAACCAGGCCG | : | 220 | | |
| 4M1/11_C10 | : |GC..C.....G.T.C.....G..... | : | 199 | | |
| 4M1/26_C2 | : | ..... | : | 211 | | |
| | | | | | | |
| | * | 240 | * | 260 | * | |
| 4M1/1_H2 | : | GGAGCTGGTGCGAGGGCAAGAACTTCTACACCCGGAGCGCGTTTCCTGAGCGCCGT | : | 275 | | |
| 4M1/11_C10 | : |G..... | : | 254 | | |
| 4M1/26_C2 | : |G..... | : | 266 | | |
| | | | | | | |
| | | 280 | * | 300 | * | 320 |
| 4M1/1_H2 | : | CAAGGCGTACCCAGGCTTCGCCCATGGCGGGTCGCAGGTGCAGGGCAAGCGCGAG | : | 330 | | |
| 4M1/11_C10 | : | ..... | : | 309 | | |
| 4M1/26_C2 | : |G.....C..CG....CG..C..... | : | 321 | | |
| | | | | | | |
| | | 340 | * | 360 | * | 380 |
| 4M1/1_H2 | : | ATCGCCGCCTTCTTCGCGCATGTACGCACGAGACCGGGCATTGTGTGCTACATCA | : | 385 | | |
| 4M1/11_C10 | : |C.C.....C..... | : | 364 | | |
| 4M1/26_C2 | : | ..T.....C..... | : | 376 | | |
| | | | | | | |
| | * | 400 | * | 420 | * | 440 |
| 4M1/1_H2 | : | ACGAGGTCAACAAGAGCAACGCCTACTGCGACCCGACCAAGAGGCAGTGGCCGTG | : | 440 | | |
| 4M1/11_C10 | : | G....A..... | : | 419 | | |
| 4M1/26_C2 | : | G....A..... | : | 431 | | |

Figure 6b
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| | | | | | | |
|------------|---|-------------------|------------------|-----------------|-----|-------------|
| | * | 460 | * | 480 | * | |
| 4M1/1_H2 | : | CGCCGCGGGCAGAA | TACTACGGGCGCGGCC | CGCTGCAGATCTCGT | GGA | ACTAC : 495 |
| 4M1/11_C10 | : | ..... |  |  |  | : 474 |
| 4M1/26_C2 | : |C.....C..... | | | | : 486 |

| | | | | | | | |
|------------|-----|---------------------|------------------|-------------|--------------|-------|-----|
| | 500 | * | 520 | * | 540 | * | |
| 4M1/1_H2 | : | AACTACGGGCGCGGG | GAGGGCCATCGGCTTC | GACGGGCTGGG | GAGACCCGGACA | : | 550 |
| 4M1/11_C10 | : |C..G.....C.G.. | | | | : 529 | |
| 4M1/26_C2 | : | ..... |  |  |  | : 541 | |

| | | | | | | |
|------------|-----|------------------------------------|------------------|------------------|---------|-------|
| | 560 | * | 580 | * | 600 | |
| 4M1/1_H2 | : | GACTGGCGCAGGACCC | CGTGTTGTCGTTCAAG | TCGGCGCTCTGGTTCT | GGATGAA | : 605 |
| 4M1/11_C10 | : | .GG.....G....G.....G..G.....G..... | | | | : 584 |
| 4M1/26_C2 | : |G..... | | | | : 596 |

| | | | | | | | |
|------------|---|------------------|-----------------|-----------------|-----------|-------|--|
| | * | 620 | * | 640 | * | 660 | |
| 4M1/1_H2 | : | CAACGTGCACCGTGTG | ATGCCGCAGGGCTTC | GGCGCCACCATCAGG | GCCATCAAC | : 660 | |
| 4M1/11_C10 | : | ..... |  |  |  | : 639 | |
| 4M1/26_C2 | : | ..... |  |  |  | : 651 | |

| | | | | | | |
|------------|---|--------------------|-----------------|-----------------|----------|-------|
| | * | 680 | * | 700 | * | |
| 4M1/1_H2 | : | GGCGCCCTCGAGTGCG | GGCGGGAACAACCCG | CCCAGATGAACGCGC | GCTCGGCT | : 715 |
| 4M1/11_C10 | : |G.....AA..... | | | | : 694 |
| 4M1/26_C2 | : |AA..... | | | | : 706 |

| | | | | | | | |
|------------|-----|-------------------------------------|------------------|-----------------|----------|-------|--|
| | 720 | * | 740 | * | 760 | * | |
| 4M1/1_H2 | : | ACTACAGGCAGTACTG | CCGCCAGCTCGGCGTC | GACCCGGGCAACAAC | CTCACCTG | : 770 | |
| 4M1/11_C10 | : |A.....AG.....C.....A..GCC..... | | | | : 749 | |
| 4M1/26_C2 | : | | | | | : 761 | |

| | | | | |
|------------|---|---|---|-----|
| 4M1/1_H2 | : | C | : | 771 |
| 4M1/11_C10 | : | . | : | 750 |
| 4M1/26_C2 | : | . | : | 762 |

Figure 7
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| | | | | | | |
|------------|---|--|---|----|---|--|
| | * | 20 | * | 40 | * | |
| 4M1/1_H2 | : | SMQNCGCQPNVCCSKFGYCGTTDEYCGDGCQSGPCRSGGGGSSGGGGGGGGSSGGA | : | 55 | | |
| 4M1/11_C10 | : |ASG..... | : | 48 | | |
| 4M1/26_C2 | : |ASG.....GED...A..... | : | 52 | | |

| | | | | | | | |
|------------|----|---|----|-----|-----|---|--|
| | 60 | * | 80 | * | 100 | * | |
| 4M1/1_H2 | : | NVANVVTDAFFNGIKNQAGSWCEGKNFYTRSAFLSAVKAYPGFAHGGSQVQGKRE | : | 110 | | | |
| 4M1/11_C10 | : | ...S...GS.....S....G..... | : | 103 | | | |
| 4M1/26_C2 | : |G.....R... | : | 107 | | | |

| | | | | | | |
|------------|-----|---|-----|-----|-----|--|
| | 120 | * | 140 | * | 160 | |
| 4M1/1_H2 | : | IAAFFAHVTHETGHLCYINEVNKSNAYCDPTKRQWPCAAGQKYYGRGPLQISWNY | : | 165 | | |
| 4M1/11_C10 | : |A.....F...S..... | : | 158 | | |
| 4M1/26_C2 | : |F...S..... | : | 162 | | |

| | | | | | | | |
|------------|---|--|---|-----|---|-----|--|
| | * | 180 | * | 200 | * | 220 | |
| 4M1/1_H2 | : | NYGPAGRAIGFDGLGDPDLRAQDPVLSFKSALWFWMNNVHRVMPQGFATIRAIN | : | 220 | | | |
| 4M1/11_C10 | : |G...R.A..A..A..... | : | 213 | | | |
| 4M1/26_C2 | : |A..... | : | 217 | | | |

| | | | | |
|------------|---|--|---|-----|
| | * | 240 | * | |
| 4M1/1_H2 | : | GALECGGNNPAQMNNARVGYYRQYCRQLGVDPGNNLTC | : | 257 |
| 4M1/11_C10 | : |N.....Q..R....P.... | : | 250 |
| 4M1/26_C2 | : |N..... | : | 254 |

Figure 8
 Novel Compositions with Improved Chitinase Activity
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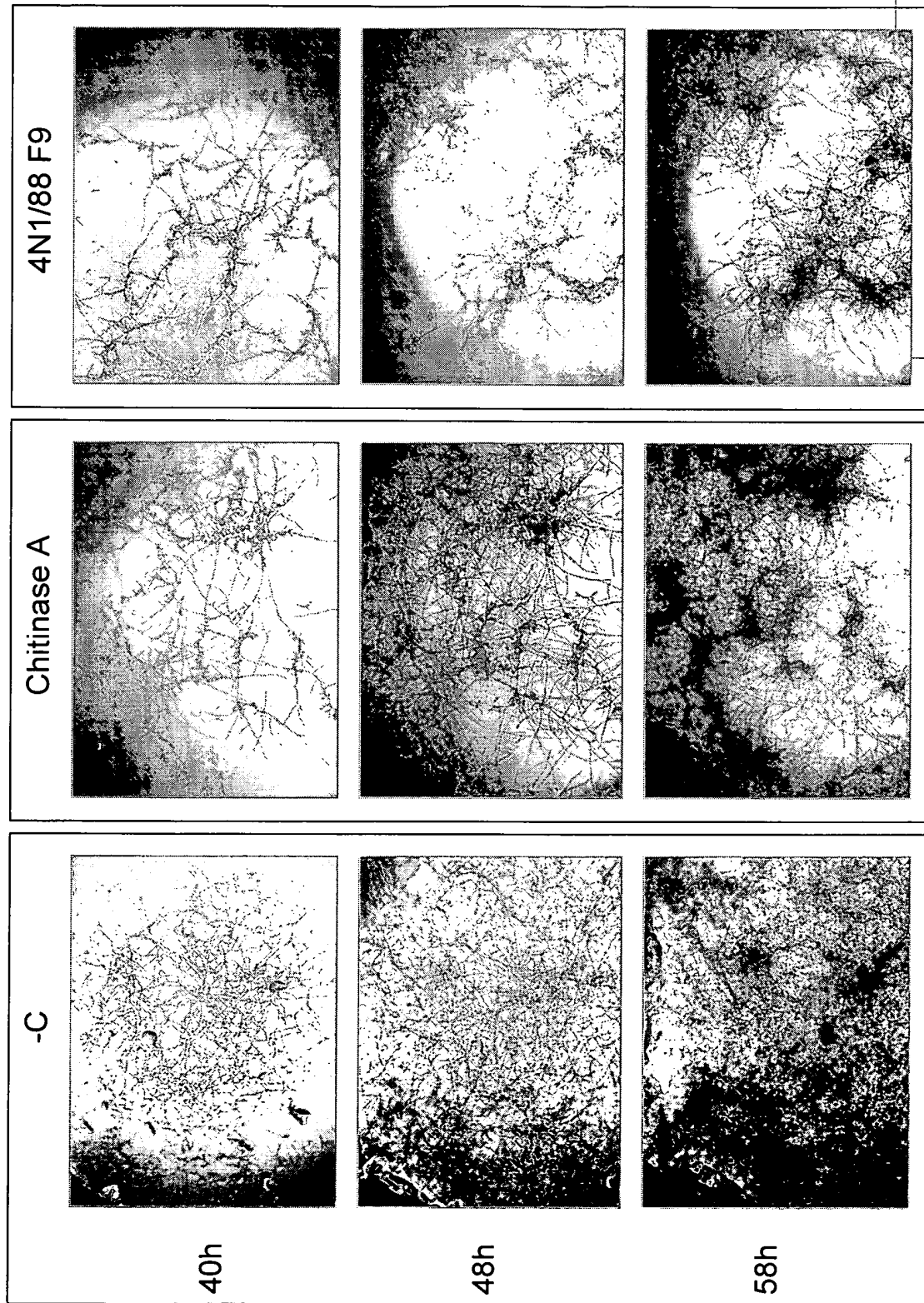


Figure 9
Novel Compositions with Improved Chitinase Activity
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Average of estimated IC50 values

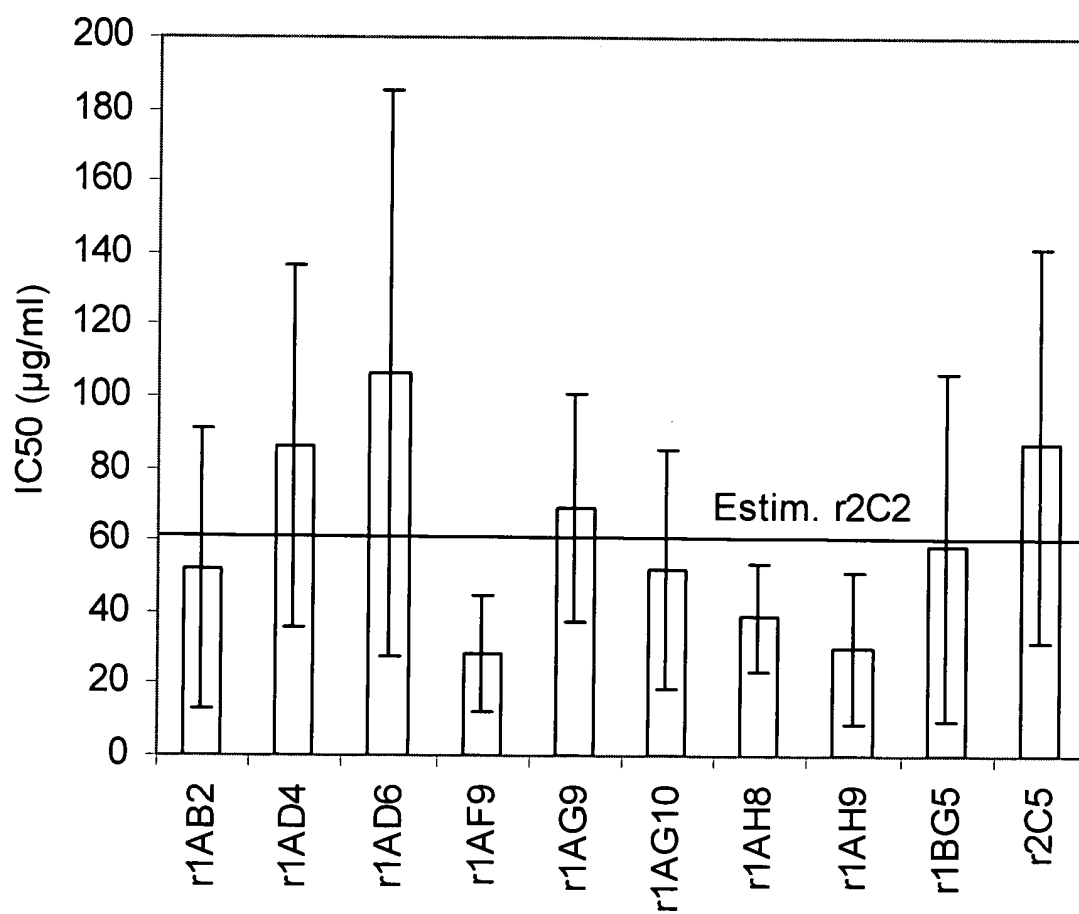


Figure 10
Novel Compositions with Improved Chitinase Activity
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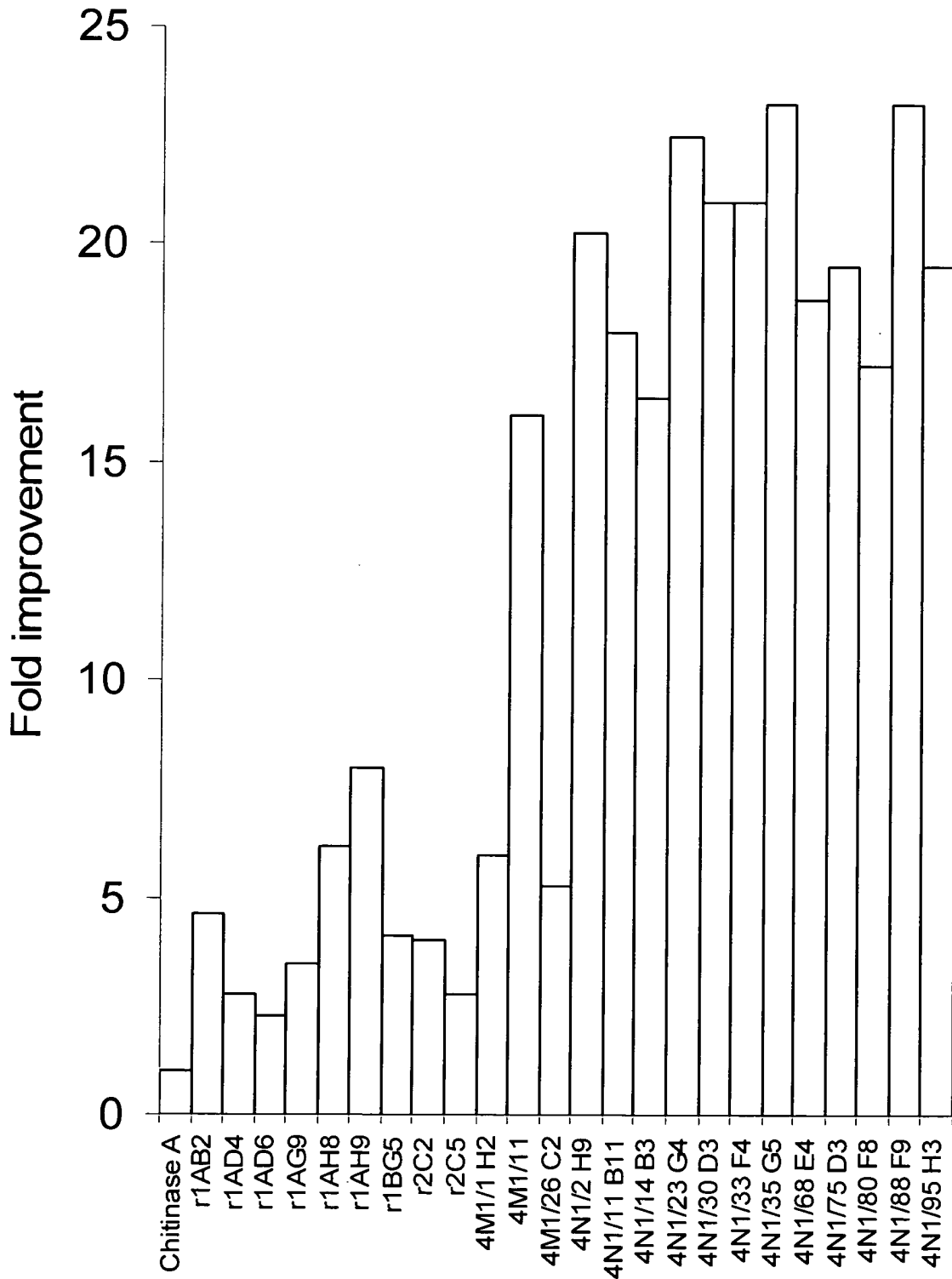


Figure 11a
Novel Compositions with Improved Chitinase Activity
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| | * | 20 | * | 40 | * | |
|------------|---|--|---|----|---|--|
| r1AB2 | : | TCGATGCAGAACTGCGGCTGCCAGCCAACTTCTGCTGCAGCAAGTTCGGCTACT | : | 55 | | |
| r1AD4 | : |G.A.....T..... | : | 55 | | |
| r1AD6 | : |T..... | : | 55 | | |
| r1AG9 | : |G.A.....T..... | : | 55 | | |
| r1AH8 | : | ..... | : | 55 | | |
| r1AH9 | : |G.A.....T..... | : | 55 | | |
| r1BG5 | : |G.A..... | : | 55 | | |
| r2C5 | : |G...GC.T.GGG.A.G.....CG..... | : | 55 | | |
| 4N1/95_H3 | : |G.A.....T..... | : | 55 | | |
| 4N1/80_F8 | : |G.A.....CG..... | : | 55 | | |
| 4N1/75_D3 | : |G.A..... | : | 55 | | |
| 4N1/2_H9 | : |G.A.....T..... | : | 55 | | |
| 4N1/23_G4 | : |G.A.....T..... | : | 55 | | |
| 4N1/68_E4 | : |G.A.....T..... | : | 55 | | |
| 4N1/88_F9 | : |G.A.....T..... | : | 55 | | |
| 4N1/14_B3 | : |T.....G.A..... | : | 55 | | |
| 4N1/33_F4 | : |T..... | : | 55 | | |
| 4N1/11_B11 | : |G.A..... | : | 55 | | |
| 4N1/30_D3 | : | ..... | : | 55 | | |
| 4N1/35_G5 | : |G.A.....T..... | : | 55 | | |

| | 60 | * | 80 | * | 100 | * | |
|------------|----|--|----|-----|-----|---|--|
| r1AB2 | : | GCGGCACGACCGACGCCTACTGCGGCGACGGGTGCCAGTCGGGCCCCGTGCCGCTC | : | 110 | | | |
| r1AD4 | : |AG..... | : | 110 | | | |
| r1AD6 | : |AG.....C..... | : | 110 | | | |
| r1AG9 | : |A.....AG..... | : | 110 | | | |
| r1AH8 | : |AG..... | : | 110 | | | |
| r1AH9 | : |AG.....C..... | : | 110 | | | |
| r1BG5 | : |AG.....A..... | : | 110 | | | |
| r2C5 | : |AG..... | : | 110 | | | |
| 4N1/95_H3 | : |AG..... | : | 110 | | | |
| 4N1/80_F8 | : |AG.....G..... | : | 110 | | | |
| 4N1/75_D3 | : |AG..... | : | 110 | | | |
| 4N1/2_H9 | : |AG..... | : | 110 | | | |
| 4N1/23_G4 | : |AG..... | : | 110 | | | |
| 4N1/68_E4 | : |AG.....C.....A..... | : | 110 | | | |
| 4N1/88_F9 | : |A.....AG.....A..... | : | 110 | | | |
| 4N1/14_B3 | : |AG.....C..... | : | 110 | | | |
| 4N1/33_F4 | : | | : | 110 | | | |
| 4N1/11_B11 | : |AG.....C..... | : | 110 | | | |
| 4N1/30_D3 | : |A.....AG..... | : | 110 | | | |
| 4N1/35_G5 | : |AG.....C..... | : | 110 | | | |

Figure 11b
Novel Compositions with Improved Chitinase Activity
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| | 120 | * | 140 | * | 160 | |
|------------|--|---|-----|---|-------------------|-------|
| r1AB2 | : GGGCGGCGGCGGCAGCAGTGGCGGCGGT | | | | | : 138 |
| r1AD4 | :T...G..G.C.....CGGAGGCGGC | | | | -----GGAGGCAGTGGC | : 159 |
| r1AD6 | : | | | | | : 138 |
| r1AG9 | :T...G..G.C.....CGGAGGCGGC | | | | -----GGAGGCAGTGGC | : 159 |
| r1AH8 | : | | | | | : 138 |
| r1AH9 | :G..G.C.....CGGAGGCGGC | | | | -----GGAGGCAGTGGC | : 159 |
| r1BG5 | :T.....GGCGGCGGCAGCGGCGGAGGCAGTGGC | | | | | : 165 |
| r2C5 | :G..G.C.....AGGCGGC | | | | -----GGAGGCAGTGGC | : 156 |
| 4N1/95_H3 | : | | GGT | | | : 141 |
| 4N1/80_F8 | :T...G..G.C.....CGGAGGCGGC | | | | -----GGAGGCAGTGGC | : 159 |
| 4N1/75_D3 | :G..G.C.....AGGCGGC | | | | -----GGAGGCAGTGGC | : 156 |
| 4N1/2_H9 | : | | GGT | | | : 141 |
| 4N1/23_G4 | : | | | | | : 138 |
| 4N1/68_E4 | : | | | | | : 138 |
| 4N1/88_F9 | :T...G..G..... | | | | | : 138 |
| 4N1/14_B3 | : | | | | | : 138 |
| 4N1/33_F4 | :T...G..G.....AGGCGGC | | | | -----GGAGGCAGTGGC | : 156 |
| 4N1/11_B11 | :G.TG.C.....AGGCGGC | | | | -----GGAGGCAGTGGC | : 156 |
| 4N1/30_D3 | :G..G.C.....CGGAGGCGGC | | | | -----GGAGGCAGTGGC | : 159 |
| 4N1/35_G5 | : ...T.....T...G..G.C.....CGGAGGCGGC | | | | -----GGAGGCAGTGGT | : 159 |

| | * | 180 | * | 200 | * | 220 | |
|------------|---|-----|---|-----|---|-----|-------|
| r1AB2 | : GGTGCGAACGTGGCTAGCGTCGTCACCGGCTCCTTCTTCAACGGCATCAAGAGCC | | | | | | : 193 |
| r1AD4 | :AT..G.....A.G.G.....A.. | | | | | | : 214 |
| r1AD6 | : | | | | | A.. | : 193 |
| r1AG9 | :AT..G.....A.G.G.....A.. | | | | | | : 214 |
| r1AH8 | :T.....A..... | | | | | | : 193 |
| r1AH9 | :AT..G.....A.G.G.....A.. | | | | | | : 214 |
| r1BG5 | :AT..G.....A.. | | | | | | : 220 |
| r2C5 | : | | | G | | A.. | : 211 |
| 4N1/95_H3 | : ---.....AT..G.....A.G.G.....A.. | | | | | | : 193 |
| 4N1/80_F8 | :AT..G.....A.G.G.....A.. | | | | | | : 214 |
| 4N1/75_D3 | : | | | | | A.. | : 211 |
| 4N1/2_H9 | : ---.T.....C...A...G.....A.. | | | | | | : 193 |
| 4N1/23_G4 | : | | | | | | : 193 |
| 4N1/68_E4 | : | | | | | A.. | : 193 |
| 4N1/88_F9 | : | | | | | A.. | : 193 |
| 4N1/14_B3 | : | | | | | A.. | : 193 |
| 4N1/33_F4 | :AT..G.....A.G.G.....A.. | | | | | | : 211 |
| 4N1/11_B11 | : | | | | | | : 211 |
| 4N1/30_D3 | :AT..G.....A.G.G.....A.. | | | | | | : 214 |
| 4N1/35_G5 | : | | | A | | A.. | : 214 |

Figure 11c
Novel Compositions with Improved Chitinase Activity
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| | * | 240 | * | 260 | * | |
|------------|---|---|---|-------------|---|-----|
| r1AB2 | : | AGGCCGGGAGCGGGTGCGAGGGCAAGAACTTCTACACCCGGAGCGCGTTCCTGAG | : | | | 248 |
| r1AD4 | : | ..... | : | .....CGA | : | 269 |
| r1AD6 | : | ..... | : |  | : | 248 |
| r1AG9 | : | ..... | : | .....CGA | : | 269 |
| r1AH8 | : | ..... | : |  | : | 248 |
| r1AH9 | : | ..... | : | .....A..... | : | 269 |
| r1BG5 | : | ..... | : |  | : | 275 |
| r2C5 | : | ..... | : |  | : | 266 |
| 4N1/95_H3 | : | ..... | : |  | : | 248 |
| 4N1/80_F8 | : | ..... | : |  | : | 269 |
| 4N1/75_D3 | : | ..... | : |  | : | 266 |
| 4N1/2_H9 | : | ..... | : |  | : | 248 |
| 4N1/23_G4 | : | ..... | : |  | : | 248 |
| 4N1/68_E4 | : | ..... | : |  | : | 248 |
| 4N1/88_F9 | : | ..... | : |  | : | 248 |
| 4N1/14_B3 | : | ..... | : |  | : | 248 |
| 4N1/33_F4 | : | ..... | : |  | : | 266 |
| 4N1/11_B11 | : | ..... | : |  | : | 266 |
| 4N1/30_D3 | : | ..... | : |  | : | 269 |
| 4N1/35_G5 | : | ..... | : |  | : | 269 |

| | 280 | * | 300 | * | 320 | * | |
|------------|---|---|-----|---|-----|---|--|
| r1AB2 | : CGCCGTCAAGGCGTACCCAGGCTTCGCCCATGGCGGCTCCGAGGTCGAGCGCAAG | : | 303 | | | | |
| r1AD4 | : G...A..GCC.....G.....G..... | : | 324 | | | | |
| r1AD6 | : | : | 303 | | | | |
| r1AG9 | : G...A..GCC.....G.....G..... | : | 324 | | | | |
| r1AH8 | :C.....G.....GA.G....G..G.... | : | 303 | | | | |
| r1AH9 | :G..GC...GC..G.... | : | 324 | | | | |
| r1BG5 | :G..AC...GC..G.... | : | 330 | | | | |
| r2C5 | :GA.G....G..G.... | : | 321 | | | | |
| 4N1/95_H3 | : | : | 303 | | | | |
| 4N1/80_F8 | :G..GC...GC..G.... | : | 324 | | | | |
| 4N1/75_D3 | :G..AC...GC..G.... | : | 321 | | | | |
| 4N1/2_H9 | :GA.G....G..G.... | : | 303 | | | | |
| 4N1/23_G4 | :G..GC...GC..G.... | : | 303 | | | | |
| 4N1/68_E4 | :G..GC...GC..G.... | : | 303 | | | | |
| 4N1/88_F9 | :G..AC...GC..G.... | : | 303 | | | | |
| 4N1/14_B3 | :C.....G.....GA.G....G.... | : | 303 | | | | |
| 4N1/33_F4 | :G..AC...GC..G.... | : | 321 | | | | |
| 4N1/11_B11 | : | : | 321 | | | | |
| 4N1/30_D3 | :G..AC...GC..G.... | : | 324 | | | | |
| 4N1/35_G5 | :G..GC...GC..G.... | : | 324 | | | | |

Figure 11d
Novel Compositions with Improved Chitinase Activity
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| | 340 | * | 360 | * | 380 | |
|------------|--|---|----------------|---|----------|-------|
| r1AB2 | : CGCGAGATTGCCGCTTCTTCGCGCATGTACGCACGAGACCGGGCATTCTGCT | | | | | : 358 |
| r1AD4 | : | | C.C..... | | | : 379 |
| r1AD6 | :C..... | | C.C.....T..... | | | : 358 |
| r1AG9 | : | | C.C..... | | | : 379 |
| r1AH8 | :C..... | | C.C..... | | | : 358 |
| r1AH9 | :C..... | | C.C..... | | | : 379 |
| r1BG5 | :C..... | | | | | : 385 |
| r2C5 | :C..... | | C.....CA..... | | | : 376 |
| 4N1/95_H3 | : | | | | | : 358 |
| 4N1/80_F8 | :C..... | | C.C..... | | | : 379 |
| 4N1/75_D3 | :C..... | | | | C... : | 376 |
| 4N1/2_H9 | :C..... | | | | T..... : | 358 |
| 4N1/23_G4 | :C..... | | | | | : 358 |
| 4N1/68_E4 | :C..... | | | | T..... : | 358 |
| 4N1/88_F9 | :C..... | | | | | : 358 |
| 4N1/14_B3 | : | | C.C..... | | | : 358 |
| 4N1/33_F4 | : | | | | | : 376 |
| 4N1/11_B11 | : | | C.C..... | | | : 376 |
| 4N1/30_D3 | :C..... | | C.C..... | | | : 379 |
| 4N1/35_G5 | :C..... | | | | | : 379 |

| | * | 400 | * | 420 | * | 440 | |
|------------|---|-----|---|-----|---|-----|-------|
| r1AB2 | : ACATCAGCGAGATCAACAAGAGCAACGCCTACTGCGACCCGACCAAGAGGCAGTG | | | | | | : 413 |
| r1AD4 | :G..... | | | | | | : 434 |
| r1AD6 | : | | | | | | : 413 |
| r1AG9 | :G..... | | | | | | : 434 |
| r1AH8 | :A..... | | | | | | : 413 |
| r1AH9 | : | | | | | | : 434 |
| r1BG5 | : | | | | | | : 440 |
| r2C5 | : | | | | | | : 431 |
| 4N1/95_H3 | : | | | | | | : 413 |
| 4N1/80_F8 | : | | | | | | : 434 |
| 4N1/75_D3 | :G..... | | | | | | : 431 |
| 4N1/2_H9 | :G..... | | | | | | : 413 |
| 4N1/23_G4 | : | | | | | | : 413 |
| 4N1/68_E4 | : | | | | | | : 413 |
| 4N1/88_F9 | : | | | | | | : 413 |
| 4N1/14_B3 | : | | | | | | : 413 |
| 4N1/33_F4 | : | | | | | | : 431 |
| 4N1/11_B11 | :A..... | | | | | | : 431 |
| 4N1/30_D3 | : | | | | | | : 434 |
| 4N1/35_G5 | : | | | | | | : 434 |

Figure 11e
Novel Compositions with Improved Chitinase Activity
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| | * | 460 | * | 480 | * | |
|------------|---|---|---|------|---|-----|
| r1AB2 | : | GCCGTGCGCCGCGGGGCAGAAGTACTACGGGCGCGGCCCGCTGCAGATCTCGTGG | : | | : | 468 |
| r1AD4 | : | ..... | : |  | : | 489 |
| r1AD6 | : | ..... | : |  | : | 468 |
| r1AG9 | : | ..... | : |  | : | 489 |
| r1AH8 | : | ..... | : |  | : | 468 |
| r1AH9 | : | ..... | : |  | : | 489 |
| r1BG5 | : | ..... | : |  | : | 495 |
| r2C5 | : | ..... | : |  | : | 486 |
| 4N1/95_H3 | : | ..... | : |  | : | 468 |
| 4N1/80_F8 | : | ..... | : |  | : | 489 |
| 4N1/75_D3 | : | ..... | : |  | : | 486 |
| 4N1/2_H9 | : | ..... | : |  | : | 468 |
| 4N1/23_G4 | : | ..... | : |  | : | 468 |
| 4N1/68_E4 | : | ..... | : | C.G. | : | 468 |
| 4N1/88_F9 | : | ..... | : |  | : | 468 |
| 4N1/14_B3 | : | ..... | : |  | : | 468 |
| 4N1/33_F4 | : | ..... | : |  | : | 486 |
| 4N1/11_B11 | : | ..... | : |  | : | 486 |
| 4N1/30_D3 | : | ..... | : | C.G. | : | 489 |
| 4N1/35_G5 | : | ..... | : | T. | : | 489 |

| | 500 | * | 520 | * | 540 | * | |
|------------|-----|---------|-----|---|-----|-----|-----|
| r1AB2 | : | AACTACA | : | ACTACGGGCCCCGCGGGGAGGGCCATCGGCTTCGACGGGCTCGGGGACC | : | | 523 |
| r1AD4 | : | | : | | : | | 544 |
| r1AD6 | : | | : | T. | : | | 523 |
| r1AG9 | : | | : | | : | | 544 |
| r1AH8 | : | | : | | : | | 523 |
| r1AH9 | : | | : | C. | : | A. | 544 |
| r1BG5 | : | | : | | : | | 550 |
| r2C5 | : | | : | C. | : | | 541 |
| 4N1/95_H3 | : | | : | | : | | 523 |
| 4N1/80_F8 | : | | : | T. | : | | 544 |
| 4N1/75_D3 | : | | : | T. | : | | 541 |
| 4N1/2_H9 | : | | : | | : | | 523 |
| 4N1/23_G4 | : | | : | | : | | 523 |
| 4N1/68_E4 | : | | : | C. | : | A. | 523 |
| 4N1/88_F9 | : | | : | | : | A. | 523 |
| 4N1/14_B3 | : | | : | G. | : | | 523 |
| 4N1/33_F4 | : | | : | | : | | 541 |
| 4N1/11_B11 | : | | : | | : | CC. | 541 |
| 4N1/30_D3 | : | | : | C. | : | A. | 544 |
| 4N1/35_G5 | : | | : | | : | CC. | 544 |

Figure 11f
Novel Compositions with Improved Chitinase Activity
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| | 560 | * | 580 | * | 600 | |
|------------|---|---|-----|---|-----|-------|
| r1AB2 | : CCGGCAGGGTGGCGCGGGACGCCGTGGTGGCGTTCAAGGCGGCGCTCTGGTTCTG | | | | | : 578 |
| r1AD4 | : | | | | | : 599 |
| r1AD6 | :A....C....C..... | | | | | : 578 |
| r1AG9 | : | | | | | : 599 |
| r1AH8 | : | | | | | : 578 |
| r1AH9 | : ..AA.....A..... | | | | | : 599 |
| r1BG5 | :A.....A.C.....T.....A... | | | | | : 605 |
| r2C5 | : | | | | | : 596 |
| 4N1/95_H3 | : | | | | | : 578 |
| 4N1/80_F8 | : ..AA..... | | | | | : 599 |
| 4N1/75_D3 | : | | | | | : 596 |
| 4N1/2_H9 | :T..... | | | | | : 578 |
| 4N1/23_G4 | : | | | | | : 578 |
| 4N1/68_E4 | : ..AA.....A.....A.C.....T..... | | | | | : 578 |
| 4N1/88_F9 | : ..AA.....A..... | | | | | : 578 |
| 4N1/14_B3 | : | | | | | : 578 |
| 4N1/33_F4 | : | | | | | : 596 |
| 4N1/11_B11 | : | | | | | : 596 |
| 4N1/30_D3 | : ..AA.....C....C..... | | | | | : 599 |
| 4N1/35_G5 | : ..AA.....A..... | | | | | : 599 |

| | * | 620 | * | 640 | * | 660 | |
|------------|---|-----|---|-----|---|-----|-------|
| r1AB2 | : GATGAACAACGTGCACCGTGTGATGCCGCAGGGCTTCGGCGCCACCATCAGGGCC | | | | | | : 633 |
| r1AD4 | : | | | | | | : 654 |
| r1AD6 | :G.....G.G...G..... | | | | | | : 633 |
| r1AG9 | : | | | | | | : 654 |
| r1AH8 | : | | | | | | : 633 |
| r1AH9 | :G.....G.G...G.....G.....C..... | | | | | | : 654 |
| r1BG5 | :G.G...A.....AGC.C....C..... | | | | | | : 660 |
| r2C5 | :G.....G.G.....C....G..... | | | | | | : 651 |
| 4N1/95_H3 | : | | | | | | : 633 |
| 4N1/80_F8 | :G.....G.G...G.....G.....C..... | | | | | | : 654 |
| 4N1/75_D3 | : | | | | | | : 651 |
| 4N1/2_H9 | :G.....G.G...GC.....G..... | | | | | | : 633 |
| 4N1/23_G4 | : | | | | | | : 633 |
| 4N1/68_E4 | : | | | | | | : 633 |
| 4N1/88_F9 | : | | | | | | : 633 |
| 4N1/14_B3 | :C..... | | | | | | : 633 |
| 4N1/33_F4 | : | | | | | | : 651 |
| 4N1/11_B11 | : | | | | | | : 651 |
| 4N1/30_D3 | : | | | | | | : 654 |
| 4N1/35_G5 | : | | | | | | : 654 |

Figure 11g
Novel Compositions with Improved Chitinase Activity
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| | * | 680 | * | 700 | * | |
|------------|---|--|------------------------------------|-----|-----|--|
| r1AB2 | : | ATCAACGGCGCCCTCGAGTGC | GACGGCAAGAACCCCAACTCCGTCAACAACCGCG | : | 688 | |
| r1AD4 | : |G...G...C.....GC.CAGA.G...GCG.... | | : | 709 | |
| r1AD6 | : |A....G...C.....GC.CAGA.G...GCG.... | | : | 688 | |
| r1AG9 | : |G...G...C.....GC.CAGA.G...GCG.... | | : | 709 | |
| r1AH8 | : |A....G...C.....GC.CAGA.G...GCG.... | | : | 688 | |
| r1AH9 | : |A....G...C.....GC.CAGA.G...GCG.... | | : | 709 | |
| r1BG5 | : |G...G...C.....GC.CAGA.G...GCG.... | | : | 715 | |
| r2C5 | : |G.....G...C.....GC.CAGA.G...GCG.... | | : | 706 | |
| 4N1/95_H3 | : |G...G...C.....GC.CAGA.G...GCG.... | | : | 688 | |
| 4N1/80_F8 | : |A....G...C.....GC.CAGA.G...GCG.... | | : | 709 | |
| 4N1/75_D3 | : |G...G...C.....GC.CAGA.G...GCG.... | | : | 706 | |
| 4N1/2_H9 | : |A.....G...G...C.....GC.CAGA.G...GCG.... | | : | 688 | |
| 4N1/23_G4 | : |G...G...C.....GC.CAGA.G...GCG.... | | : | 688 | |
| 4N1/68_E4 | : |G...G...C.....GC.CAGA.G...GCG.... | | : | 688 | |
| 4N1/88_F9 | : |G...G...C.....GC.CAGA.G...GCG...A | | : | 688 | |
| 4N1/14_B3 | : | | | : | 688 | |
| 4N1/33_F4 | : |G...C.....GC.CAGA.G...GCG.... | | : | 706 | |
| 4N1/11_B11 | : |G.....G...C.....GC.CAGA.G...GCG.... | | : | 706 | |
| 4N1/30_D3 | : |A....G...G...C.....GC.CAGA.GG...GCG.... | | : | 709 | |
| 4N1/35_G5 | : |G...G...C.....GC.CAGA.G...GCG.... | | : | 709 | |

| | 720 | * | 740 | * | 760 | * | |
|------------|-----|--|--------------------------|---|-----|---|--|
| r1AB2 | : | TCGCCTACTACAAGCAGTTCTGCCAGGATTT | CGGCGTCGACCCAGGGCCCAACCT | : | 743 | | |
| r1AD4 | : | ...G.....A.....GCC.GC..... | | : | 764 | | |
| r1AD6 | : | ...G.....A.....GCC.GC..... | | : | 743 | | |
| r1AG9 | : | ...G.....A.....GCC.GC..... | | : | 764 | | |
| r1AH8 | : | ...G.....A.....C.GC...C..... | | : | 743 | | |
| r1AH9 | : | ...G.....G.....A.....GCC.GC..... | | : | 764 | | |
| r1BG5 | : | ...G.....A.....CC.GC..... | | : | 770 | | |
| r2C5 | : | ...G.....A.....C.GC...C.....G...CAA..... | | : | 761 | | |
| 4N1/95_H3 | : | ...G.....A.....GCC.GC..... | | : | 743 | | |
| 4N1/80_F8 | : | ...G.....A.....GCC.GC..... | | : | 764 | | |
| 4N1/75_D3 | : | ...G.....G.....A.....GCC.GC..... | | : | 761 | | |
| 4N1/2_H9 | : | ...G.....A.....CC.GC..... | | : | 743 | | |
| 4N1/23_G4 | : | ...G.....G.....A.....GCC.GC..... | | : | 743 | | |
| 4N1/68_E4 | : | ...G.....G.....A.....GCC.GC..... | | : | 743 | | |
| 4N1/88_F9 | : | ...G.....A.....GCC.GC..... | | : | 743 | | |
| 4N1/14_B3 | : | ...G.....A.....GCC.GC..... | | : | 743 | | |
| 4N1/33_F4 | : | ...G.....G.....A.....GCC.GC..... | | : | 761 | | |
| 4N1/11_B11 | : | ...G.....A.....GCC.GC..... | | : | 761 | | |
| 4N1/30_D3 | : | ...G.....A.....GCC.GC..... | | : | 764 | | |
| 4N1/35_G5 | : | ...G.....A.....GCC.GC..... | | : | 764 | | |

Figure 11h
Novel Compositions with Improved Chitinase Activity
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| | | | | |
|------------|---|---------|---|-----|
| r1AB2 | : | TACTTGC | : | 750 |
| r1AD4 | : | C..... | : | 771 |
| r1AD6 | : | C..... | : | 750 |
| r1AG9 | : | C..... | : | 771 |
| r1AH8 | : | C..... | : | 750 |
| r1AH9 | : | C..... | : | 771 |
| r1BG5 | : | C..... | : | 777 |
| r2C5 | : | C..... | : | 768 |
| 4N1/95_H3 | : | C..... | : | 750 |
| 4N1/80_F8 | : | C..... | : | 771 |
| 4N1/75_D3 | : | C..... | : | 768 |
| 4N1/2_H9 | : | C..... | : | 750 |
| 4N1/23_G4 | : | C..... | : | 750 |
| 4N1/68_E4 | : | C..... | : | 750 |
| 4N1/88_F9 | : | C..... | : | 750 |
| 4N1/14_B3 | : | C..... | : | 750 |
| 4N1/33_F4 | : | C..... | : | 768 |
| 4N1/11_B11 | : | C..... | : | 768 |
| 4N1/30_D3 | : | C..... | : | 771 |
| 4N1/35_G5 | : | C..... | : | 771 |

Figure 12a
Novel Compositions with Improved Chitinase Activity
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| | * | 20 | * | 40 | * | |
|------------|---|--|------|----|---|----|
| r1AB2 | : | SMQNCGCQPNFCCSKFGYCGTTDAYCGDGCQSGPCRSGGGGSSGGG | ---- | : | | 46 |
| r1AD4 | : |V.....E.....GG...GGG--GGSG | | : | | 53 |
| r1AD6 | : |E...A..... | ---- | : | | 46 |
| r1AG9 | : |V.....E.....GG...GGG--GGSG | | : | | 53 |
| r1AH8 | : |E..... | ---- | : | | 46 |
| r1AH9 | : |V.....E.....P...GG...GGG--GGSG | | : | | 53 |
| r1BG5 | : |V.....E.....H.....C...GGGSGGGSG | | : | | 55 |
| r2C5 | : |ASGM.....E.....GG...GG--GGSG | | : | | 52 |
| 4N1/95_H3 | : |V.....E.....G----- | | : | | 47 |
| 4N1/80_F8 | : |V.....E.....R.....GG...GGG--GGSG | | : | | 53 |
| 4N1/75_D3 | : |V.....E.....GG...GG--GGSG | | : | | 52 |
| 4N1/2_H9 | : |V.....E.....G----- | | : | | 47 |
| 4N1/23_G4 | : |V.....E..... | ---- | : | | 46 |
| 4N1/68_E4 | : |V.....E...A.....H..... | ---- | : | | 46 |
| 4N1/88_F9 | : |V.....E.....H.....GG...-- | ---- | : | | 46 |
| 4N1/14_B3 | : |V.....E...A..... | ---- | : | | 46 |
| 4N1/33_F4 | : |GG...GG--GGSG | | : | | 52 |
| 4N1/11_B11 | : |V.....E.....P...GG...GG--GGSG | | : | | 52 |
| 4N1/30_D3 | : |E.....GG...GGG--GGSG | | : | | 53 |
| 4N1/35_G5 | : |V.....E.....P...GG...GGG--GGSG | | : | | 53 |

| | 60 | * | 80 | * | 100 | * | |
|------------|----|---|----|---|-----|---|-----|
| r1AB2 | : | GANVASVVTGSFFNGIKSQAGSGCEGKNFYTRSAFLSAVKAYPGFAHGGSEVERK | | : | | | 101 |
| r1AD4 | : |N...DA....N.....E...A..... | | : | | | 108 |
| r1AD6 | : |N..... | | : | | | 101 |
| r1AG9 | : |N...DA....N.....E...A..... | | : | | | 108 |
| r1AH8 | : | .V.....D.....N.....G... | | : | | | 101 |
| r1AH9 | : |N...DA....N.....R.....G... | | : | | | 108 |
| r1BG5 | : |N.....N.....G... | | : | | | 110 |
| r2C5 | : |S...N.....G... | | : | | | 107 |
| 4N1/95_H3 | : | -....N...DA....N..... | | : | | | 101 |
| 4N1/80_F8 | : |N...DA....N.....G... | | : | | | 108 |
| 4N1/75_D3 | : |N.....G... | | : | | | 107 |
| 4N1/2_H9 | : | -V.....N.....G... | | : | | | 101 |
| 4N1/23_G4 | : |G... | | : | | | 101 |
| 4N1/68_E4 | : |N.....G... | | : | | | 101 |
| 4N1/88_F9 | : |N.....G... | | : | | | 101 |
| 4N1/14_B3 | : |N.....N..... | | : | | | 101 |
| 4N1/33_F4 | : |N...DA....N.....G... | | : | | | 107 |
| 4N1/11_B11 | : |G... | | : | | | 107 |
| 4N1/30_D3 | : |N...DA....N.....G... | | : | | | 108 |
| 4N1/35_G5 | : |D.....N.....G... | | : | | | 108 |

Figure 12b
Novel Compositions with Improved Chitinase Activity
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| | 120 | * | 140 | * | 160 | |
|------------|-----|---|-----|---|-----|-----|
| r1AB2 | : | REIAAFFAHVTHETGHFCYISEINKSNAYCDPTKRQWPCAAGQKYYGRGPLQISW | : | | | 156 |
| r1AD4 | : |A..... | : | | | 163 |
| r1AD6 | : |A..... | : | | | 156 |
| r1AG9 | : |A..... | : | | | 163 |
| r1AH8 | : |A.....N..... | : | | | 156 |
| r1AH9 | : |A..... | : | | | 163 |
| r1BG5 | : | | : | | | 165 |
| r2C5 | : |L..... | : | | | 162 |
| 4N1/95_H3 | : | | : | | | 156 |
| 4N1/80_F8 | : |A..... | : | | | 163 |
| 4N1/75_D3 | : |R..... | : | | | 162 |
| 4N1/2_H9 | : |S..... | : | | | 156 |
| 4N1/23_G4 | : | | : | | | 156 |
| 4N1/68_E4 | : | | : | | | 156 |
| 4N1/88_F9 | : | | : | | | 156 |
| 4N1/14_B3 | : |A..... | : | | | 156 |
| 4N1/33_F4 | : | | : | | | 162 |
| 4N1/11_B11 | : |A.....N..... | : | | | 162 |
| 4N1/30_D3 | : |A..... | : | | | 163 |
| 4N1/35_G5 | : | | : | | | 163 |

| | * | 180 | * | 200 | * | 220 | |
|------------|---|--|---|-----|---|-----|-----|
| r1AB2 | : | NYNYGPAGRAIGFDGLGDPGRVARDAVVAFKAALWFWMNNVHRVMPQGFATIRA | : | | | | 211 |
| r1AD4 | : | ..... | : |  |  |  | 218 |
| r1AD6 | : |Q.P.....S..G..... | : | | | | 211 |
| r1AG9 | : | ..... | : |  |  |  | 218 |
| r1AH8 | : | ..... | : |  |  |  | 211 |
| r1AH9 | : |D.....A..N...Q.....S..G.....T.. | : | | | | 218 |
| r1BG5 | : |Q.....S.....E...Q..... | : | | | | 220 |
| r2C5 | : |L.....S..G..... | : | | | | 217 |
| 4N1/95_H3 | : | ..... | : |  |  |  | 211 |
| 4N1/80_F8 | : |N.....S..G.....T.. | : | | | | 218 |
| 4N1/75_D3 | : | ..... | : |  |  |  | 217 |
| 4N1/2_H9 | : |S..G.A..... | : | | | | 211 |
| 4N1/23_G4 | : | ..... | : |  |  |  | 211 |
| 4N1/68_E4 | : |D.....A..N...Q.....S..... | : | | | | 211 |
| 4N1/88_F9 | : |D.....A..N...Q..... | : | | | | 211 |
| 4N1/14_B3 | : |G..... | : | | | | 211 |
| 4N1/33_F4 | : | ..... | : |  |  |  | 217 |
| 4N1/11_B11 | : |A..... | : | | | | 217 |
| 4N1/30_D3 | : |D.....A..N....P..... | : | | | | 218 |
| 4N1/35_G5 | : |A..N...Q..... | : | | | | 218 |

Figure 12c
Novel Compositions with Improved Chitinase Activity
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| | | | | |
|------------|---|---|---|-----|
| | * | 240 | * | |
| r1AB2 | : | INGALECDGKNPNSVNNRVAYYKQFCQDFGVDPGPNLTC | : | 250 |
| r1AD4 | : |G.N..AQ..A..G.....RQL..... | : | 257 |
| r1AD6 | : |N..AQ..A..G..... | : | 250 |
| r1AG9 | : |G.N..AQ..A..G.....RQL..... | : | 257 |
| r1AH8 | : |N..AQ..A..G.....QLR..... | : | 250 |
| r1AH9 | : |N..AQ..A..G.....RQL..... | : | 257 |
| r1BG5 | : |G.N..AQ..A..G.....HQL..... | : | 259 |
| r2C5 | : |N..AQ..A..G.....QLR....N.... | : | 256 |
| 4N1/95_H3 | : |G.N..AQ..A..G.....RQL..... | : | 250 |
| 4N1/80_F8 | : |N..AQ..A..G.....RQL..... | : | 257 |
| 4N1/75_D3 | : |G.N..AQ..A..G.....RQL..... | : | 256 |
| 4N1/2_H9 | : |G.N..AQ..A..G.....HQL..... | : | 250 |
| 4N1/23_G4 | : |G.N..AQ..A..G.....RQL..... | : | 250 |
| 4N1/68_E4 | : |G.N..AQ..A..G.....RQL..... | : | 250 |
| 4N1/88_F9 | : |G.N..AQ..A..G.....RQL..... | : | 250 |
| 4N1/14_B3 | : |RQL..... | : | 250 |
| 4N1/33_F4 | : |N..AQ..A..G.....RQL..... | : | 256 |
| 4N1/11_B11 | : |N..AQ..A..G.....RQL..... | : | 256 |
| 4N1/30_D3 | : |K.G.N..AQ..A..G.....RQL..... | : | 257 |
| 4N1/35_G5 | : |G.N..AQ..A..G.....RQL..... | : | 257 |

Round 4 - Estimated IC₅₀ values

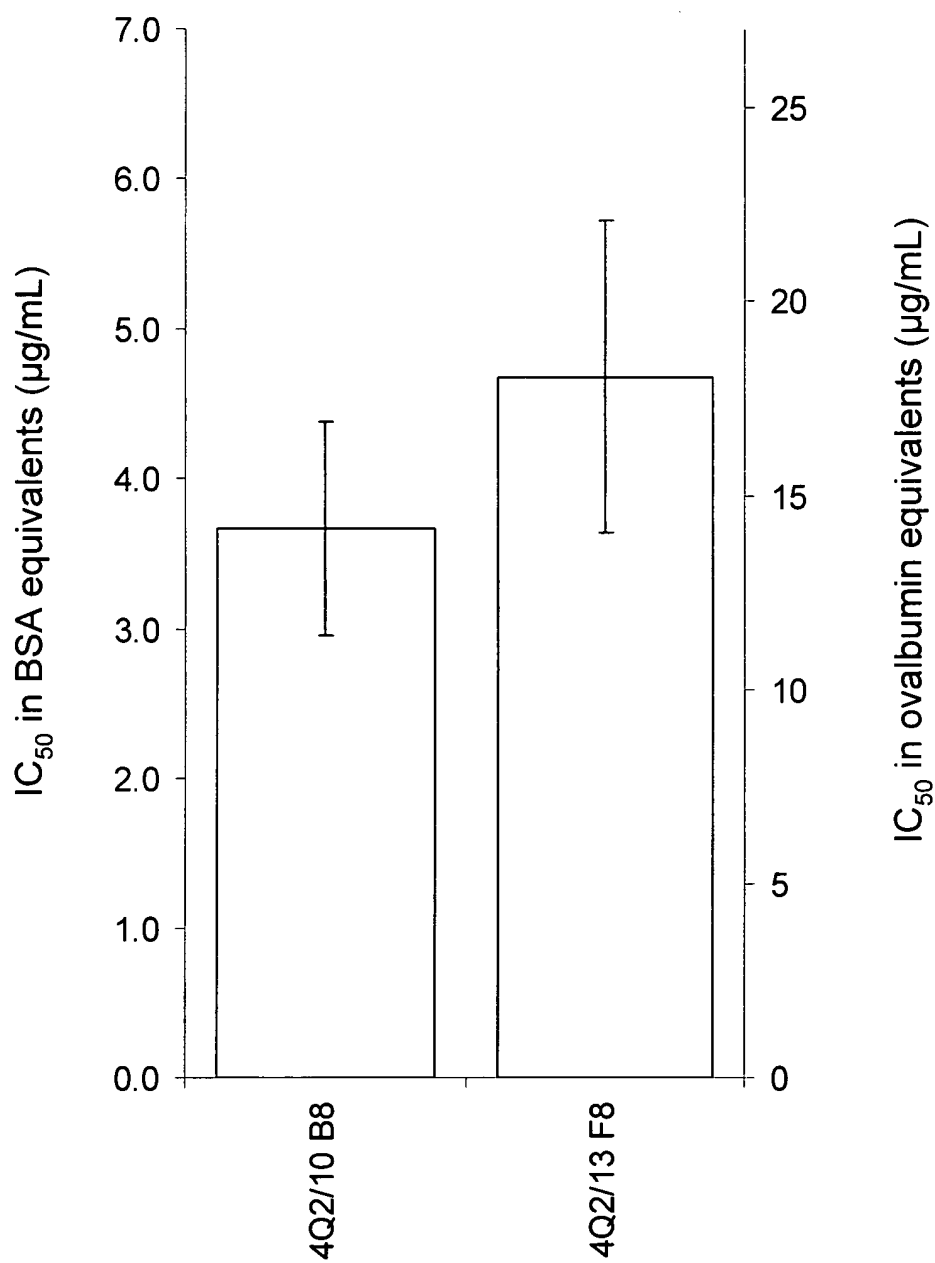


Figure 14
Novel Compositions with Improved Chitinase Activity
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Round 4 - Estimated IC50 values

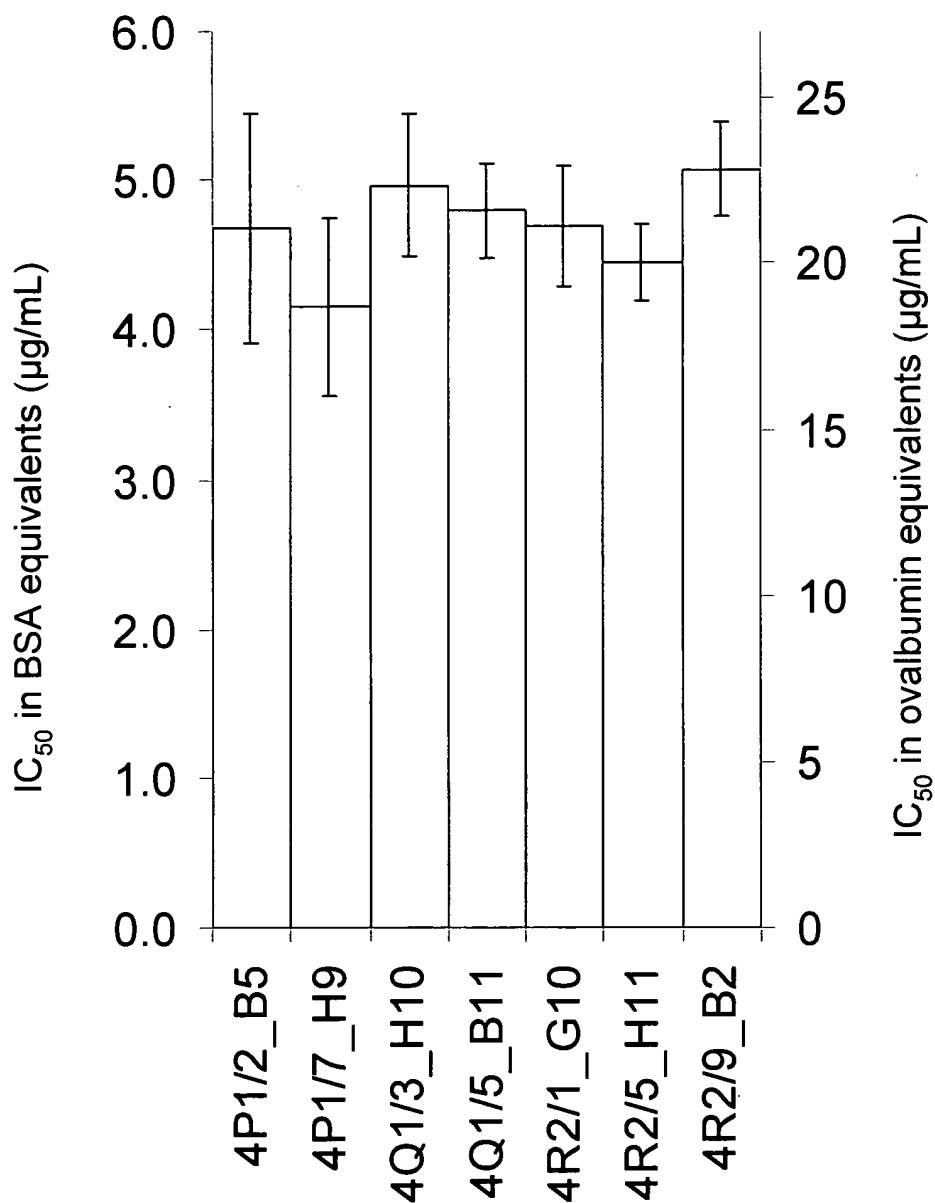


Figure 15
 Novel Compositions with Improved Chitinase Activity
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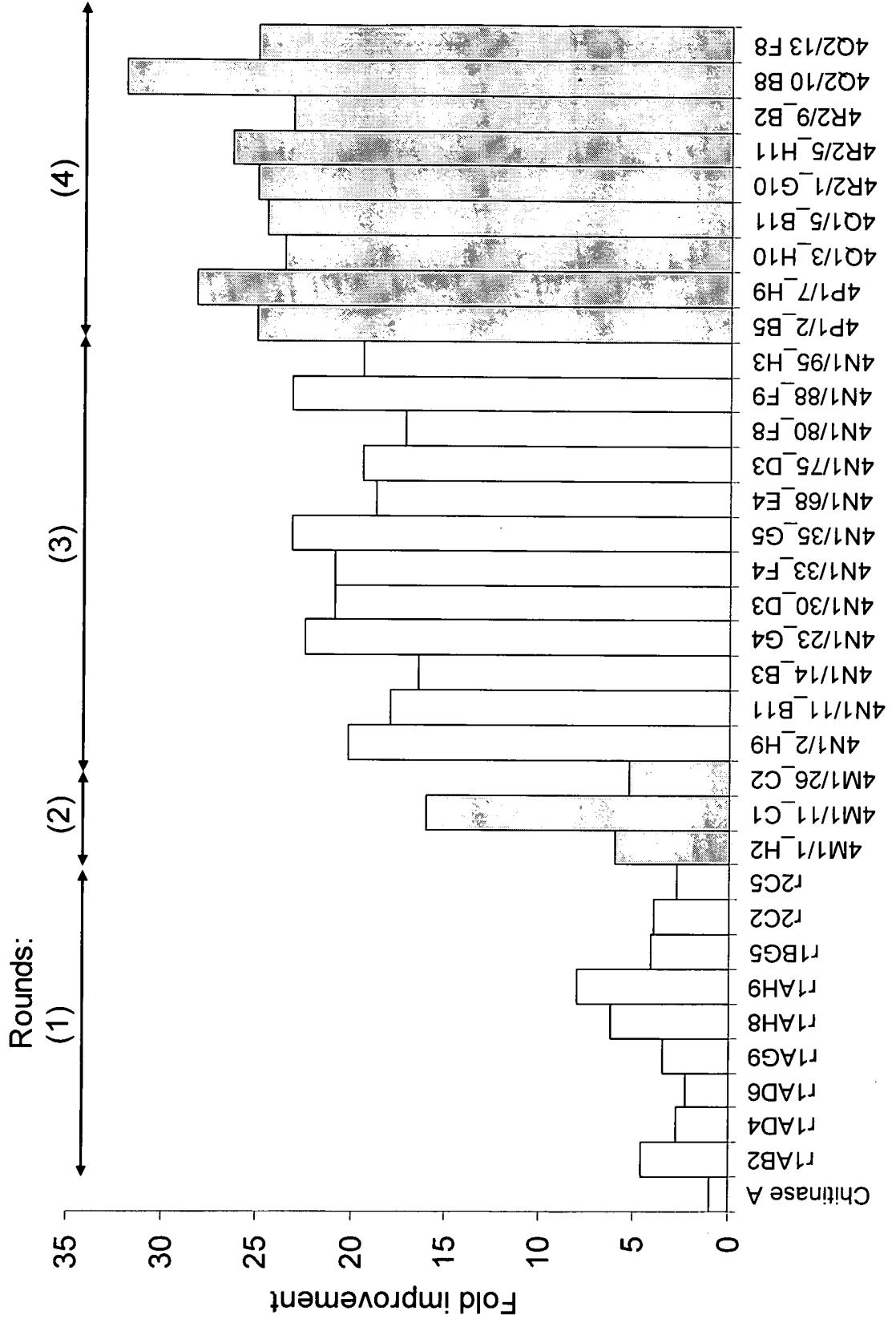


Figure 16a
Novel Compositions with Improved Chitinase Activity
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| | | |
|-------------|--|-------|
| | * 20 * 40 * | |
| 4Q2/10_B8 : | TCGATGCAGAACTGCGGCTGCCAGCCAAACGTATGCTGCAGCAAGTTTGGCTACT | : 55 |
| 4Q2/13_F8 : |C..... | : 55 |
| | 60 * 80 * 100 * | |
| 4Q2/10_B8 : | GCGGCACAACCGACGAGTACTGCGGCGACGGGTGCCAGTCGGGCCCCGTGCCGCCC | : 110 |
| 4Q2/13_F8 : |G.....A.T. | : 110 |
| | 120 * 140 * 160 | |
| 4Q2/10_B8 : | GGGTGGCGGTGGCGGCGGCGGCGGCGGAGGCGGCGGAGGCAGTGGCGGCGGT | : 165 |
| 4Q2/13_F8 : | ..-----A.----- | : 138 |
| | * 180 * 200 * 220 | |
| 4Q2/10_B8 : | GGTGTGAACGTGGCCAGCATCGTGACCGGCTCCTTCTTCAACGGCATCAAGAACC | : 220 |
| 4Q2/13_F8 : | ..... | : 193 |
| | * 240 * 260 * | |
| 4Q2/10_B8 : | AGGCCGGGAGCGGGTGCAGGGCAAGAACTTCTACACCCGGAGCGCGTTCCTGAG | : 275 |
| 4Q2/13_F8 : | ..... | : 248 |
| | 280 * 300 * 320 * | |
| 4Q2/10_B8 : | CGCCGTCAAGGCGTACCCAGGCTTCGCCCATGGCGGGTCACAGGTGCAGGGCAAG | : 330 |
| 4Q2/13_F8 : |A.GG.....G..... | : 303 |
| | 340 * 360 * 380 | |
| 4Q2/10_B8 : | CGCGAGATCGCCGCCTTCTTCGCGCATGTACGCATGAGACCGGGCATTCTCTGCT | : 385 |
| 4Q2/13_F8 : |T.....C.C.....C..... | : 358 |
| | * 400 * 420 * 440 | |
| 4Q2/10_B8 : | ACATCAGCGAGATCAGCAAGAGCAACGCCTACTGCGACCCGACCAAGAGGCAGTG | : 440 |
| 4Q2/13_F8 : | ..... | : 413 |
| | * 460 * 480 * | |
| 4Q2/10_B8 : | GCCGTGCGCCGCGGGGCGAGTACTACGGGCGCGGCCCGCTGCAGATCTCGTGG | : 495 |
| 4Q2/13_F8 : |A..... | : 468 |
| | 500 * 520 * 540 * | |
| 4Q2/10_B8 : | AACTACAATAACGGGCCCCGCGGGGAGGGCCATCGGCTTCGACGGGCTCGGGGACC | : 550 |
| 4Q2/13_F8 : | | : 523 |

Figure 16b
Novel Compositions with Improved Chitinase Activity
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| | | | | | | |
|-------------|--|-----|-----|-----|-----|-------|
| | 560 | * | 580 | * | 600 | |
| 4Q2/10_B8 : | CCAACAGGGTGGCGCGGGACCCCGTGCTGGCGTTCAAGGCGGCGCTCTGGTTCTG | | | | | : 605 |
| 4Q2/13_F8 : |G.....G..... | | | | | : 578 |
| | | | | | | |
| | * | 620 | * | 640 | * | 660 |
| 4Q2/10_B8 : | GATGAACAGCGTGACGCGGGTGGTGCCGCAGGGGTTTCGGCGCCACCACCAGGGCC | | | | | : 660 |
| 4Q2/13_F8 : |C.T...A.....C.....T..... | | | | | : 633 |
| | | | | | | |
| | * | 680 | * | 700 | * | |
| 4Q2/10_B8 : | ATCAACGGCGCCCTCGAGTGCAACGGGAACAACCCCGCCAGATGAACGCGCGCG | | | | | : 715 |
| 4Q2/13_F8 : |GG.....A | | | | | : 688 |
| | | | | | | |
| | 720 | * | 740 | * | 760 | * |
| 4Q2/10_B8 : | TCGGCTACTACAGGCAGTACTGCCGCCAGCTCGGCGTCGACCCAGGGCCCAACCT | | | | | : 770 |
| 4Q2/13_F8 : |A..... | | | | | : 743 |
| | | | | | | |
| | 780 | * | 800 | * | | |
| 4Q2/10_B8 : | CACTTGCTCTAGAGGTGGAAGTCATCATCATCATCATCATCATCATTGA | | | | | : 819 |
| 4Q2/13_F8 : | | | | | | : 792 |

Figure 17
 Novel Compositions with Improved Chitinase Activity
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| | | | | | | |
|-------------|---|-----|-----|-----|-----|-----|
| | * | 20 | * | 40 | * | |
| 4Q2/10_B8 : | SMQNCGCQPNVCCSKFGYCGTTDEYCGDGCQSGPCRPGGGGGGGGGGGGGSGGG | : | 55 | | | |
| 4Q2/13_F8 : |HS-----S----- | : | 46 | | | |
| | | | | | | |
| | 60 | * | 80 | * | 100 | * |
| 4Q2/10_B8 : | GVNVASIVTGSFFNGIKNQAGSGCEGKNFYTRSAFLSAVKAYPGFAHGGSQVQGK | : | 110 | | | |
| 4Q2/13_F8 : |TE.E.. | : | 101 | | | |
| | | | | | | |
| | 120 | * | 140 | * | 160 | |
| 4Q2/10_B8 : | REIAAFFAHVTHETGHFCYISEISKSNAYCDPTKRQWPCAAGQKYYGRGPLQISW | : | 165 | | | |
| 4Q2/13_F8 : |A..... | : | 156 | | | |
| | | | | | | |
| | * | 180 | * | 200 | * | 220 |
| 4Q2/10_B8 : | NYNYGPAGRAIGFDGLGDPNRRVARDPVLAFKAALWFMNSVHGVVPQGFGATTR | : | 220 | | | |
| 4Q2/13_F8 : |A.V.....R.M.....I.. | : | 211 | | | |
| | | | | | | |
| | * | 240 | * | 260 | * | |
| 4Q2/10_B8 : | INGALECNGNNPAQMNARVGYYRQYCRQLGVDPGNLTCSRGGSHHHHHHHH- | : | 272 | | | |
| 4Q2/13_F8 : |G.....I...K.....- | : | 263 | | | |

Figure 18a
 Novel Compositions with Improved Chitinase Activity
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| | | | | | | |
|-----------|---|---|---|----|---|--|
| | * | 20 | * | 40 | * | |
| 4P1/2_B5 | : | TCGATGCAGAACTGCGGCTGCCAGCCAAACGTATGCTGCAGCAAGTTCGGCTACT | : | 55 | | |
| 4P1/7_H9 | : | ..... | : | 55 | | |
| 4Q1/3_H10 | : | ..... | : | 55 | | |
| 4R2/5_H11 | : |T..... | : | 55 | | |
| 4R2/1_G10 | : |T..... | : | 55 | | |
| 4Q1/5_B11 | : | ..... | : | 55 | | |
| 4R2/9_B2 | : | ..... | : | 55 | | |

| | | | | | | | |
|-----------|----|--|----|-----|-----|---|--|
| | 60 | * | 80 | * | 100 | * | |
| 4P1/2_B5 | : | GCGGCACAACCGACGAGTACTGCGGCGACGGGTGCCAGTCGGGCCCCGTGCCGCTC | : | 110 | | | |
| 4P1/7_H9 | : | ..... | : | 110 | | | |
| 4Q1/3_H10 | : |G..... | : | 110 | | | |
| 4R2/5_H11 | : |G.....A... | : | 110 | | | |
| 4R2/1_G10 | : |G.....C.....A... | : | 110 | | | |
| 4Q1/5_B11 | : |G.....C..... | : | 110 | | | |
| 4R2/9_B2 | : |G.....C..... | : | 110 | | | |

| | | | | | | |
|-----------|-----|---|-----|-----|-----|--|
| | 120 | * | 140 | * | 160 | |
| 4P1/2_B5 | : | GCGGCGGCGGCGGCGGCGGAGGCGG-----CGGAGGCAGTGGTGCGTGC | : | 156 | | |
| 4P1/7_H9 | : |A..A.T..C..... | : | 144 | | |
| 4Q1/3_H10 | : |T.....C.....CGGAGGCGG.....C..... | : | 165 | | |
| 4R2/5_H11 | : |A..A.T..C.....TGG----- | : | 144 | | |
| 4R2/1_G10 | : |A.....C..... | : | 141 | | |
| 4Q1/5_B11 | : |T.....C.....AGGCGG---.....C..... | : | 162 | | |
| 4R2/9_B2 | : |T.....C.....AGGCGG---..... | : | 162 | | |

| | | | | | | | |
|-----------|---|---|---|-----|---|-----|--|
| | * | 180 | * | 200 | * | 220 | |
| 4P1/2_B5 | : | AACGTGGCTAGCGTCGTCACCGGCTCCTTCTTCAACGGCATCAAGAACCAGGCCG | : | 211 | | | |
| 4P1/7_H9 | : | ..... | : | 199 | | | |
| 4Q1/3_H10 | : |AT..G.....A.G.G.....G..... | : | 220 | | | |
| 4R2/5_H11 | : | ..T.....AT..G.....A.G.G..... | : | 199 | | | |
| 4R2/1_G10 | : |A.....G..... | : | 196 | | | |
| 4Q1/5_B11 | : |A.....G..... | : | 217 | | | |
| 4R2/9_B2 | : |G..... | : | 217 | | | |

| | | | | | | |
|-----------|---|--|---|-----|---|--|
| | * | 240 | * | 260 | * | |
| 4P1/2_B5 | : | GGAGCGGGTGCGAGGGCAAGAACTTCTACACCGGAGCGCGTTCTTGAGCGCCGT | : | 266 | | |
| 4P1/7_H9 | : | ..... | : | 254 | | |
| 4Q1/3_H10 | : | ..... | : | 275 | | |
| 4R2/5_H11 | : | ..... | : | 254 | | |
| 4R2/1_G10 | : | ..... | : | 251 | | |
| 4Q1/5_B11 | : | ..... | : | 272 | | |
| 4R2/9_B2 | : | | : | 272 | | |

Figure 18b
Novel Compositions with Improved Chitinase Activity
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| | 280 | * | 300 | * | 320 | * | |
|-----------|-----|---|-----|-----|-----|---|--|
| 4P1/2_B5 | : | CAAGGCGTACCCAGGCTTCGCCCATGGCGGGTCACAGGTGCAGGGCAAGCGCGAG | : | 321 | | | |
| 4P1/7_H9 | : | | : | 309 | | | |
| 4Q1/3_H10 | : | | : | 330 | | | |
| 4R2/5_H11 | : |G..... | : | 309 | | | |
| 4R2/1_G10 | : |G..... | : | 306 | | | |
| 4Q1/5_B11 | : |G..... | : | 327 | | | |
| 4R2/9_B2 | : |G..... | : | 327 | | | |

| | 340 | * | 360 | * | 380 | |
|-----------|-----|--|-----|-----|-----|--|
| 4P1/2_B5 | : | ATTGCCGCCTTCTTCGCGCACGCCACGCACGAGACCGGGCATTCTGCTACATCA | : | 376 | | |
| 4P1/7_H9 | : | ..C.....T..... | : | 364 | | |
| 4Q1/3_H10 | : | ..C..... | : | 385 | | |
| 4R2/5_H11 | : |T..... | : | 364 | | |
| 4R2/1_G10 | : | ..C.....T.T..... | : | 361 | | |
| 4Q1/5_B11 | : | ..C.....T.T..... | : | 382 | | |
| 4R2/9_B2 | : | ..C.....T.T..... | : | 382 | | |

| | * | 400 | * | 420 | * | 440 | |
|-----------|---|---|---|-----|---|-----|--|
| 4P1/2_B5 | : | GCGAGATCAACAAGAGCAACGCCTACTGCGACCCGACCAAGAGGCAGTGGCCGTG | : | 431 | | | |
| 4P1/7_H9 | : |G..... | : | 419 | | | |
| 4Q1/3_H10 | : | ..... | : | 440 | | | |
| 4R2/5_H11 | : | ..... | : | 419 | | | |
| 4R2/1_G10 | : | ..... | : | 416 | | | |
| 4Q1/5_B11 | : | A..... | : | 437 | | | |
| 4R2/9_B2 | : | ..... | : | 437 | | | |

| | * | 460 | * | 480 | * | |
|-----------|---|---|---|-----|---|--|
| 4P1/2_B5 | : | CGCCGCGGGGCAGAAGTACTACGGGCGCGGCCCCGCTGCAGATCTCGTGGAACCTAC | : | 486 | | |
| 4P1/7_H9 | : | ..... | : | 474 | | |
| 4Q1/3_H10 | : | ..... | : | 495 | | |
| 4R2/5_H11 | : | ..... | : | 474 | | |
| 4R2/1_G10 | : | ..... | : | 471 | | |
| 4Q1/5_B11 | : |G.....T..... | : | 492 | | |
| 4R2/9_B2 | : |T..... | : | 492 | | |

| | 500 | * | 520 | * | 540 | * | |
|-----------|-----|--|-----|-----|-----|---|--|
| 4P1/2_B5 | : | AACTACGGGCCCCGCGGGGAGGGCCATCGGCTTCGACGGGCTCGGGGACCCCAACA | : | 541 | | | |
| 4P1/7_H9 | : |A.....GG.. | : | 529 | | | |
| 4Q1/3_H10 | : |GG.. | : | 550 | | | |
| 4R2/5_H11 | : |GG.. | : | 529 | | | |
| 4R2/1_G10 | : |CC..... | : | 526 | | | |
| 4Q1/5_B11 | : |GG.. | : | 547 | | | |
| 4R2/9_B2 | : |T.....CC..... | : | 547 | | | |

Figure 18c
Novel Compositions with Improved Chitinase Activity
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| | | | | | | |
|-----------|-----|---|-----|-----|-----|--|
| | 560 | * | 580 | * | 600 | |
| 4P1/2_B5 | : | GGGTGGCGCAGGACGCCGTGGTGGCGTTCAAGGCGGCGCTCTGGTTCTGGATGAA | : | 596 | | |
| 4P1/7_H9 | : |G..... | : | 584 | | |
| 4Q1/3_H10 | : |G..... | : | 605 | | |
| 4R2/5_H11 | : |G..... | : | 584 | | |
| 4R2/1_G10 | : | ..... | : | 581 | | |
| 4Q1/5_B11 | : |G..... | : | 602 | | |
| 4R2/9_B2 | : | ..... | : | 602 | | |

| | | | | | | | |
|-----------|---|---|---|-----|---|-----|--|
| | * | 620 | * | 640 | * | 660 | |
| 4P1/2_B5 | : | CAACGTGCACCGTGTGATGCCGCAGGGCTTCGGCGCCACCATCAGGGCCATCAAC | : | 651 | | | |
| 4P1/7_H9 | : | ..... | : | 639 | | | |
| 4Q1/3_H10 | : | ..... | : | 660 | | | |
| 4R2/5_H11 | : |G.....T.....C..... | : | 639 | | | |
| 4R2/1_G10 | : | ..... | : | 636 | | | |
| 4Q1/5_B11 | : | ..... | : | 657 | | | |
| 4R2/9_B2 | : | ..... | : | 657 | | | |

| | | | | | | |
|-----------|---|---|---|-----|---|--|
| | * | 680 | * | 700 | * | |
| 4P1/2_B5 | : | GGCGCGCTCGAGTGCACGGGAACAACCCCGCCCAGATGAACGCGCGCTCGGCT | : | 706 | | |
| 4P1/7_H9 | : |A..... | : | 694 | | |
| 4Q1/3_H10 | : |A..... | : | 715 | | |
| 4R2/5_H11 | : |C.....G.....A..... | : | 694 | | |
| 4R2/1_G10 | : | ..... | : | 691 | | |
| 4Q1/5_B11 | : |C.....A..... | : | 712 | | |
| 4R2/9_B2 | : |C.....G..... | : | 712 | | |

| | | | | | | | |
|-----------|-----|---|-----|-----|-----|---|--|
| | 720 | * | 740 | * | 760 | * | |
| 4P1/2_B5 | : | ACTACAAGCAGTACTGCCGCCAGCTCGGCGTCGACCCAGGGCCCAACCTCACTTG | : | 761 | | | |
| 4P1/7_H9 | : | ..... | : | 749 | | | |
| 4Q1/3_H10 | : | ..... | : | 770 | | | |
| 4R2/5_H11 | : | ..... | : | 749 | | | |
| 4R2/1_G10 | : | ..... | : | 746 | | | |
| 4Q1/5_B11 | : | ..... | : | 767 | | | |
| 4R2/9_B2 | : |G..... | : | 767 | | | |

| | | | | | |
|-----------|-----|--|-----|-----|--|
| | 780 | * | 800 | * | |
| 4P1/2_B5 | : | CTCTAGAGGTGGAAGTCATCATCATCATCATCATCATTGA | : | 804 | |
| 4P1/7_H9 | : | ..... | : | 792 | |
| 4Q1/3_H10 | : | ..... | : | 813 | |
| 4R2/5_H11 | : | ..... | : | 792 | |
| 4R2/1_G10 | : | ..... | : | 789 | |
| 4Q1/5_B11 | : | ..... | : | 810 | |
| 4R2/9_B2 | : | ..... | : | 810 | |

Figure 19
 Novel Compositions with Improved Chitinase Activity
 Muller, et al.
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| | * | 20 | * | 40 | * | |
|-----------|---|--|--------------|------|------|------|
| 4P1/2_B5 | : | SMQNCGCQPNVCCSKFGYCGTTDEYCGDGCQSGGPCRS | GGGGGGGGGGGG | --- | SGGA | : 52 |
| 4R2/1_G10 | : |A.....H.....S..... | ----- | | | : 47 |
| 4R2/9_B2 | : |P..... | GG- | .... |  | : 54 |
| 4P1/7_H9 | : |SS..... | ----- | | | : 48 |
| 4R2/5_H11 | : |H.....SS..... | ----- | | | : 48 |
| 4Q1/3_H10 | : |GGG..... | | | | : 55 |
| 4Q1/5_B11 | : |P..... | GG- | .... |  | : 54 |

| | 60 | * | 80 | * | 100 | * | |
|-----------|----|---|-----------|---|-----|---|-------|
| 4P1/2_B5 | : | NVASVVTGSFFNGIKNQAGSGCEGKNFYTRSAFLSAVKAYPGFAH | GSQVQGKRE | | | | : 107 |
| 4R2/1_G10 | : |D.....S..... | | | | | : 102 |
| 4R2/9_B2 | : |S..... | | | | | : 109 |
| 4P1/7_H9 | : | | | | | | : 103 |
| 4R2/5_H11 | : | ...N...DA..... | | | | | : 103 |
| 4Q1/3_H10 | : | ...N...DA.....S..... | | | | | : 110 |
| 4Q1/5_B11 | : |D.....S..... | | | | | : 109 |

| | 120 | * | 140 | * | 160 | |
|-----------|-----|---|----------|---|-----|-------|
| 4P1/2_B5 | : | IAAFFAHATHETGHFCYISEINKSNAYCDPTKRQWPCAAGQKYYGRG | PLQISWNY | | | : 162 |
| 4R2/1_G10 | : |V..... | | | | : 157 |
| 4R2/9_B2 | : |V..... | | | | : 164 |
| 4P1/7_H9 | : |S..... | | | | : 158 |
| 4R2/5_H11 | : | | | | | : 158 |
| 4Q1/3_H10 | : | | | | | : 165 |
| 4Q1/5_B11 | : |V.....N..... | | | | : 164 |

| | * | 180 | * | 200 | * | 220 | |
|-----------|---|--|------------|-----|---|-----|-------|
| 4P1/2_B5 | : | NYGPAGRAIGFDGLGDPNRVAQDAVVAFKAAALWFWMNNVHRVMPQ | GFGATIRAIN | | | | : 217 |
| 4R2/1_G10 | : |A..... | | | | | : 212 |
| 4R2/9_B2 | : |A..... | | | | | : 219 |
| 4P1/7_H9 | : |D.....G...R..... | | | | | : 213 |
| 4R2/5_H11 | : |G...R..... | | | | | : 213 |
| 4Q1/3_H10 | : |G...R..... | | | | | : 220 |
| 4Q1/5_B11 | : |G...R..... | | | | | : 219 |

| | * | 240 | * | 260 | * | |
|-----------|---|---|---|-----|---|-------|
| 4P1/2_B5 | : | GALECDGNNPAQMNARVGYKQYCRQLGVDPGPNLTCSRGGSHHHHHHHH | - | | | : 267 |
| 4R2/1_G10 | : | ..... | - |  |  | : 262 |
| 4R2/9_B2 | : |G..... | - | | | : 269 |
| 4P1/7_H9 | : | ..... | - |  |  | : 263 |
| 4R2/5_H11 | : |G..... | - | | | : 263 |
| 4Q1/3_H10 | : | ..... | - |  |  | : 270 |
| 4Q1/5_B11 | : | ..... | - |  |  | : 269 |